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FIRE MANAGEMENT

WINTER 1975 Vol. 36, No. 1
U. S. DEPARTMENT OF AGRICULTURE • FOREST SERVICE

AGRICULTURE
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CURRENT SERIAL RECORDS

INTEGRATE FIRE MANAGEMENT WITH LAND-USE PLANNING	FIRE PLANNING	FIRE MANAGEMENT POLICY

FIRE MANAGEMENT AND LAND-USE PLANNING

ECOSYSTEM DYNAMICS	FUELS AND ECOSYSTEM DYNAMICS	FUEL ASSESSMENT

ECOLOGICAL PRINCIPLES

COMMUNICATION SKILLS

PUBLIC INVOLVEMENT	TEAMWORK	GROUP DYNAMICS

OPERATIONAL TOOLS

COMPUTER TECHNIQUES	TECHNICAL INFORMATION SYSTEMS	PROGRAM PLANNING AND BUDGET

FIRE MANAGEMENT

An international quarterly periodical devoted to forest fire management

WINTER 1975 Vol. 36, No. 1
U. S. DEPARTMENT OF AGRICULTURE • FOREST SERVICE

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Earl L. Butz, *Secretary of Agriculture*

John R. McGuire, *Chief, Forest Service*

Henry W. DeBruin, *Director, Division of Fire Management*

Edwin J. Young, *Managing Editor*

A Challenge to Trainees

Rexford A. Resler

Rexford A. Resler, Associate Chief, Forest Service, U.S. Department of Agriculture, Washington, D.C.

I welcome the opportunity to open this course in Advanced Fire Management and am especially pleased to see the people from Interior, the States, and Canada here, too.

I believe in the importance of training and feel this activity and others like it are critical to our success as managers of public land. The challenges of a changing world place new demands on us almost daily. Think for a moment about the need to keep pace with change. Perhaps the only constant is change.

Consider:

- The events in our Nation's Capital recently.
- The educational level, the affluence, the interests of our citizens.
- The social concern and responsibility resource-oriented agencies must redeem.
- The energy crisis and all its broad implications for all resources.
- The effect of inflation on everything we do and the way we do it.

A pragmatic approach to solving problems as they occur, using past experience, isn't enough. Why is this training experience so important in the face of all this?

Training is the catalyst for change. It's the vehicle for applying new solutions to problems. It's the trigger to innovate, to change, to renew, and to demonstrate personal capability on impossible problems and impossible dreams.

I'm talking about development of our greatest resource—the human resource that is the foundation of our efforts. If our human resource is up to the challenge, there are no other situations that limit our ability to perform and to meet our goals.

We're doing well as an organization in meeting our commitments, but the responsibility doesn't end there. What is your role? What is your responsibility as an individual?

- Are you willing to express new ideas at the possible risk of questioning here and at home?
- Can you implement a new way of doing your job—even at the risk of questioning by your peers?
- Can you work hard at adapting new ideas to your problems even to the point of many redesigns?
- Are you open to ideas from others, especially subordinates, young people, minorities, and others with different reference points?
- Do you continue to read, study, and learn on your own?

If you can answer these questions "yes," then you can benefit from this training experience. Management in all organizations represented here is dedicated to the benefits of training; you must do your part.

Training costs $5 million a year in the Forest Service alone; that money is well spent only if our training objectives are accomplished and our management improved.

Man-Caused Fire

We in the Forest Service have been deeply involved in fire issues in the past few months. Just 2 weeks ago I discussed wilderness and fire management policy on the "Today" show and a month ago Chief McGuire discussed fire management at the Tall Timbers Fire and Land Management Symposium in Missoula.

"Are we retiring Smokey?" was asked on the "Today" show.

Obviously, we cannot adopt any fire prevention policy other than the long-standing goal of preventing man-caused fire. As you move into programs of careful fire by prescription, the importance of your prevention effort increases manyfold. Misinterpreting and rationalizing man-caused fires, just because we use fire by prescription, will surely slow, if not stop, other fire management programs.

Part of the problem is our failure to inform the public of new programs and their relationship to fire prevention or Smokey Bear. Each of you must shoulder this responsibility in your zone of influence. It is your repsonsibility to lay to rest the "Ban Smokey" syndrome.

A Challenge to Trainees, p. 4

"A Challenge to Trainees" was presented by Rexford A. Resler at the Advanced Fire Management Course, Marana, Ariz., November 12, 1974.

A Challenge to Trainees
Rexford A. Resler, from p. 3

The careful, professional use of fire by prescription, based upon scientific knowledge of the ecosystem, is an important management tool. Fire has been used in many parts of the country for years for disease control, rough reduction, fuel reduction, and habitat improvement. The natural role of fire in various ecosystems, especially wilderness, is more recent and other programs will be topics of discussion at this session.

The Park Service also is pursuing a continuing program of using natural fire in certain parks. Their efforts are producing important changes in managing the ecosystems within the parks.

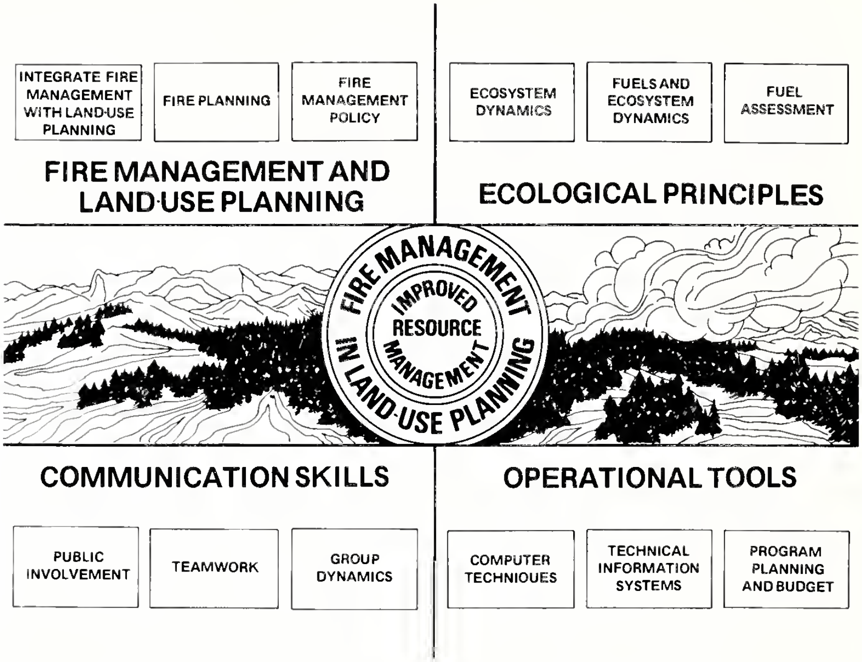
Don't forget that the public does not differentiate between agencies; all of us are either called to task or praised for each other's deeds. If one agency program is stopped by public demand, all agency programs will be affected. So we're in this together and each of you has a responsibility to explain our programs and gain public support and acceptance.

Objectives

The major objective of this course is to integrate scientific concepts and operational tools into fire management and land-use planning for more effective application to resource management.

There are several reasons why this is important. Fire is older than history itself—a force that to this day is both good and bad. It is a force that demands massive expenditure of resources—

- Through its use in our varied forest and wild land types;
- Through its prevention in unplanned incidents, especially when man and social considerations interact in the system;
- Through its suppression when resources and human values are threatened.



The objective of the Advanced Fire Management Course was to integrate scientific concepts and operational tools into fire management and land-use planning for more effective application to resource management.

Let's look at the cost of fire activities each year.

Forest Service spends
$137 million—fire control funds
$ 30 million—brush disposal funds.

Interior spends
$ 70 million—emergency fire funds
$ 3 million—brush disposal funds.

States spend
$135 million—fire control funds
$ 20 million—brush disposal funds.

Forest Service—S&PF spends
$ 20 million—Clark McNary-2 fire control funds.

For a total of $415 million.

Obviously, we must consider the total management job—not just fire suppression—if we are to assure effective use of this money and meet our total management responsibility.

Improved Resource Management

Our primary goal and purpose is improved resource management, and the key to accomplishing effective fire management is through land-use planning.

Why should fire people be so concerned about land-use planning?

Planning is predictive in the sense that trade-offs—benefits and balances between all resources and demands—can be carefully and rationally considered.

The Forest and Rangeland Renewable Forest Resources Act (the Humphrey–Rarick Bill) requires this of the Forest Service and gives Congress a stronger role in the process.

Tools We Will Use

Ecological Principles—We must keep these in mind both in our training and in our applications of this training back home.

- Ecosystem changes
- Ecosystem dynamics

- Working examples
- Fuel assessment
- Fuel and ecosystem dynamics
- Integrate into planning.

Operational Tools—You must be able to develop program proposals that meet the needs demanded in the budget process. The most valuable proposal has to be expressed properly to become a financed reality.

Using modern planning tools and aids, especially computer-assisted techniques, is a necessity. The mass of information and the many options available preclude thorough consideration of all relevant data without analytical decisionmaking tools. We can't make future decisions on past experience alone. Those who do will be lost in the wake of progress.

We must master these operational tools:

- Program planning and budget
- Evaluation of alternatives
- Computer techniques
- Technical information systems
- Implementation of management approach
- Air quality and fire.

Communication Skills—The success of any program depends on how well the manager can communicate with his peers, subordinates, superiors, and the interested public.

- Teamwork
- Public involvement
- Group dynamics
- Behavior patterns
- Interview techniques.

Fire Management and Land-Use Planning—Here you will have the opportunity to demonstrate your skill in applying the various working tools and fire science knowledge in developing viable fire management considerations in land-use plans.

If you're good enough, your input can be part of the actual plan, but the real challenge is how well you do with the planning process in your own area back home.

- Fire management policy
- Fire planning
- Land-use planning
- Fire management
- Integrate fire management and land-use planning.

As you can see, you will be challenged. This training experience is probably superior to several credit hours of academic training. You will interact with people representing expertise and experience from most of North America. The knowledge and capability available to you here is a unique experience. Your responsibility goes beyond your involvement here to listen, learn, study, motivate others, and apply.

I'm interested in the results of training, the progress and changes initiated by training, and the progress of individuals in making things happen. This training experience is calculated to challenge you. Accept the challenge!

Take full advantage of your time here to expand your perspective, broaden your mind, and develop your storehouse of knowledge. Plan now to go home and be a change agent directed toward superior performance by yourself and your fellow workers.

NATIONAL FIRE TRAINING

Did the American Indian Use Fire?

Studies in ecology show that fire was a major force in shaping the environment prior to the white man's arrival in America.

Lightning was certainly a source of early fires, but also, the aboriginal inhabitants of the land are often given credit for the planned use of fire in reaching specific objectives. This leads us to an interesting question: Were the vegetative types which greeted the first European settler the result of the random application of fire by lightning or were they partially the result of the planned application of fire by the land's first inhabitants?

Indians recorded their history through paintings on rock and hides, and by the retelling of legends. Major events and other things that were important to them appear in legends and paintings. Except for the campfire symbol, fire is apparently not mentioned on these communication methods.

Lee Burcham, in his book "The Slow Match," concludes that southern California Indians did not use fire to modify their environment.

I would appreciate hearing from anyone who can cite recorded history, Indian legends, paintings or petroglyphs that may produce some answers to this question. I will summarize the replies in a future article for Fire Management. Please send any information to:

H. P. Gibson, Director of
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Forest Service, USDA,
633 West Wisconsin Avenue,
Milwaukee, Wisconsin 53203.

Calculating Fire-Danger Ratings
Computer vs. Tables

John E. Deeming

Fire-danger rating values derived using tables often differ somewhat from computer-derived values. Reasons include: requirements of table formats, rounding errors, and simplification of the basic NFDR equations to make them amenable to the manual solution.

A study showed that the differences between the Burning Index values computed from tables and by the computer did not exceed one index point 75 percent of the time. Seventy-five percent of the time there was no difference between the Manning Classes or Adjective Classes computed from the two methods.

Nearly every day the National Fire Danger Rating Research Work Unit at BIFC receives a call; "The Burning Index values coming out of the computer don't agree with the tables."

We will try to explain why fire-danger ratings computed by AFFIRMS[1] may differ from the results of manual calculations using the tables in RM-84[2] and the significance of these differences.

[1]Administrative Forest Fire Information Management and Retrieval System. See R. William Furman and Robert S. Helfman. Computer Time-sharing used with NFDRS. Fire Manage. 34(2):14-16, 1973.

[2]J. E. Deeming, J. W. Lancaster, M. A. Fosberg, R. W. Furman, and M. J. Schroeder. National fire-danger rating system. USDA Forest Serv. Res. Pap. RM-84. 165 p. 1972. (Revised 1974, 53 p.) Rocky Mountain Forest and Range Exp. Sta., Fort Collins, Colo

John E. Deeming is a Research Forester with the National Fire-Danger Rating Research Work Unit, Rocky Mountain Forest and Range Experiment Station, stationed at Boise, Idaho. Headquarters are maintained at Fort Collins, Colo., in cooperation with Colorado State University.

Why There Are Differences

There are three reasons:

- Table construction
- Rounding procedures
- "Assumptions" made to simplify manual calculation.

Table Construction—The table on page 42 of RM-84 (page 44 in the 1974 revision) is used to determine the 1-hour timelag fuel moisture from (1) state-of-weather, (2) relative humidity, and (3) dry bulb temperature. The temperatures and relative humidities are expressed as ranges of values: The temperatures are grouped in 20-degree classes and the relative humidity in 5-percent classes. This "grouping" was necessary to limit the table to a practical 20 by 20 size. If the temperature had been presented in 1-degree increments from 10° to 110°F and the relative humidity from zero to 100 percent in 1-percent increments, the table would be 100 by 100 and have 10,000 entries.

Consider a temperature in the range of 70 to 89 degrees and a relative humidity from 20 to 24 percent. For a state-of-weather Code 0, the predicted moisture value is 3 percent. So, 3 percent is the table's answer for all of the 100 possible combinations of temperatures from 70 to 89 degrees and relative humidities from 20 to 24 percent.

Where did the value of 3 percent at the intersection of that row and column come from? A mathematical equation was used to calculate the 1-hour timelag fuel moisture from dry bulb temperatures, relative humidity, and state-of-weather. For that particular entry in the table, the equation was solved using as input a temperature of 80°F and a relative humidity of 22 percent—*the midpoint values of those groupings*. So, in this table

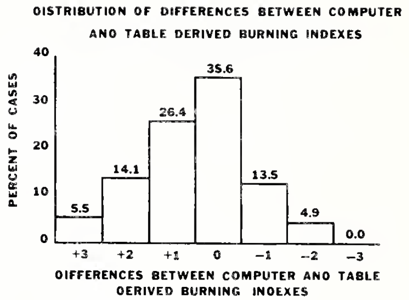


Figure 1.—Of the 151 comparisons, 35.6 percent showed perfect agreement between the computer-derived and table-derived BI's. The difference did not exceed one index point 75.5 percent of the time.

(and similarly for all others) the table answers are correct to the nearest whole number only for the range midpoint values.

The computer doesn't use the table to determine the 1-hour timelag fuel moisture, but it does use the same equation every time it makes a fire-danger calculation. The difference is that the equation is solved using the exact observed values of relative humidity and temperature.

Rounding Procedures

At every step in the table solution the results are rounded to the nearest whole number and that rounded value is carried to the next table. Rounding produces a small error, and such errors can accumulate from one computational step to the next. The computer does little rounding; it carries the fractional values of the results from one computation to the next. Look at the Ignition Component table on page 44 (46 in the revision). On a sunny day with a temperature of 90°F, the difference between the Ignition Component value corresponding to a fuel moisture of 2.6 percent (computer) and that of a rounded value of 3 percent from tables would be 6 points, 91 versus 97.

Mathematics Simplified

To make the hand calculations as short and easy as possible, the equations were simplified and shortcuts made that are not necessary when the computer is used. For instance, in the computer version, the 10-hour timelag fuel moisture is used in the calculation of the Spread Component. It is omitted in the RM-84 calculations because including it would have required an additional table and computational step.

In summary, there are three reasons why the table and computer fire-danger values differ:

- The table format requires inputs to be grouped in classes, while the computer uses each input value exactly as it is entered.
- The manual solution is subject to rounding errors; the computer solution is not.
- The computer uses more complete equations than can be readily solved using tables.

Significance of Differences?

Before the simplifications for the manual system were allowed, the NFDR Research Work Unit staff determined that those changes would not significantly affect the final ratings. But real-world examples can best demonstrate this to the field user.

For 3 weeks during August and September fire-danger ratings computed from the tables in RM-84 and those produced by AFFIRMS were compared for eight stations in eastern Idaho and western Wyoming. Fuel Models A, C, and G were represented. In all, 151 comparisons were made.

Figure 1 summarizes the comparisons of the Burning Indexes. A negative value indicates the BI derived using RM-84 was less than the AFFIRMS BI. The distribution is skewed toward the positive side because of the Spread Component. Because 10-hour timelag fuel moisture is normally higher than 1-hour timelag fuel moisture, the weighted fuel moisture used by AFFIRMS to compute the SC is higher than that used by the tables. Therefore, often SC and BI from RM-84 are slightly higher.

A primary end product of the fire-danger rating calculation is the Manning Class (MC). The fire management organization using the stations on which these comparisons are based recognize six classes: Classes 1, 2, 4, and 5 plus Low class 3 and High class 3. The appropriate MC is determined from the Burning Index. If the BI falls within a specified range of values, a certain readiness plan is indicated. By comparing the plans specified by the computer-derived and table-derived BI's, the real operational significance of the discrepancies between the two methods can be shown.

Figure 2 shows the proportion of the time that the RM-84 Manning Class was higher (positive departures) and lower (negative departures) than the AFFIRMS class in this 151-case example. For instance, the height of the bar over the "+" indicates that the RM-84 MC was one class higher than the computer MC 16 percent of the time. The two methods produced the same MC 76 percent of the time. There is a slight skewing toward positive values for the same reason as in Figure 1.

Continued on p. 9

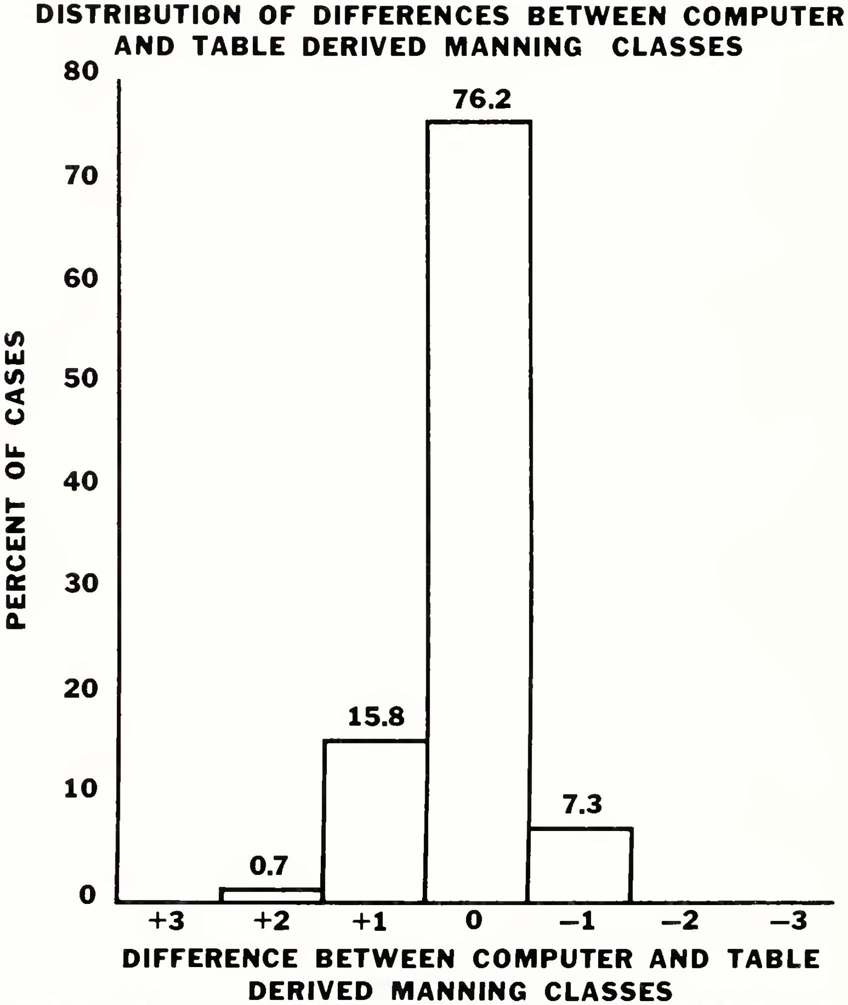


Figure 2.—The computer-derived and table-derived Manning Classes agreed perfectly in 76.2 percent of the cases; 23.1 percent of the time the difference was one class. Only once in the 151 comparisons did the difference exceed one class.

Cost Reduction for AFFIRMS Display Options

Robert J. Straub

Changing the display format is the least painful way for the fire manager to reduce the cost of AFFIRMS. Some ways to cut costs:

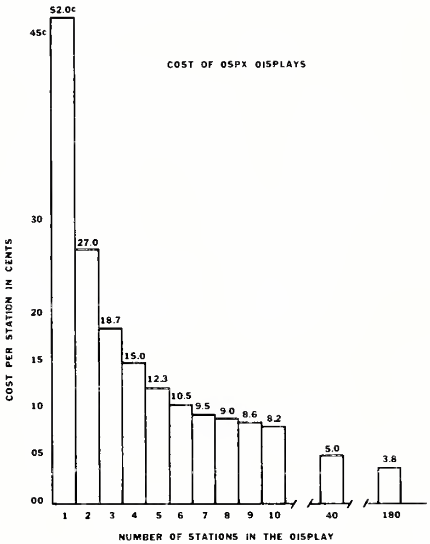
- Pick the shortest display consistent with your needs
- Suppress the headings only if more than three headings can be saved
- Don't use the special interest group for fewer than four stations
- Don't use the forest display unless absolutely necessary
- Use the mix of display criteria that shows all the required stations with fewest display commands.

The growing use of the AFFIRMS program means more fire managers are experimenting with various means for reducing costs. Here are some simple guidelines to help you choose the most economical way to produce the displays needed to meet your information needs.

Shortest Display

The length of the display has a cost effect. The DSPX is the most concise and least expensive display option. It is followed by the DSPW, then the DSPI. However, the difference is small—averaging about 1¢ more per line of output for the DSPI than for the DSPX.

Robert J. Straub is a forester assigned to the Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo. 80521.



This table shows the cost per station for the AFFIRMS DSPX display times the number of stations included in the display. Total cost is the product of the cost per station times the number of stations.

Carefully Suppress Headings

Display headings cost money, but so does the command to turn the headings off—SET HEAD OFF. Do not suppress headings unless there are at least three more displays following this command. If you do, it will cost more despite the printing and computer time charges saved.

Avoid SIG and Forest

Due to recent program improvements, the scope of the display (region, zone, state, county, and so forth) that you select to limit the size of the display does not significantly affect cost. Exceptions are the forest or unit and the special interest group (SIG) display scopes. A display defined by the forest or unit name always costs more than any other type. The larger the number of weather stations entered into AFFIRMS in your region, the greater this additional cost will be. For example, a display requested by forest name in California costs $2.33, while the same stations by LIST cost 62¢. The SIG costs approximately 2¢ more per station if the group contains fewer than five stations. For five or more stations, the SIG is as efficient as any of the other criteria.

Few Commands

The total number of display commands needed to show all of the required stations is the single most important factor in determining your display costs. In the accompanying figure the values along the vertical axis are the costs per station, including the sign-on, that result from displays containing the number of stations along the x axis. These costs were experienced at night while the computer system was lightly loaded and, therefore, are the lowest achievable; corresponding costs incurred in midafternoon operation will be somewhat higher. For example, simply signing on and off again without any displays being requested costs about 32¢ in the afternoon and only 27¢ at night.

To determine the cost of a session involving one sign-on and the display of x stations as one display, find x on the horizontal axis of the figure and read up to the cost per station. Then multiply x times the cost per station.

Example:

- 9 stations in one display of DSPX
  cost = 9(8.6¢) = 77¢

To estimate the cost of three displays of three stations each, with a new sign-on each time, use the same process.

Example:

- 1 DSPX of 3 stations
  cost = 3(18.7¢) = 56¢
- 3 DSPX of 3 stations
  cost = 3(56¢) = $1.68

A reasonable person would not sign on and off between each display, so let's reduce the total bill by the cost of these operations

$1.68 − 2(27¢) = $1.14

Comparing these two examples, both of which display 9 stations, there is a savings of 37¢ if one display command is used rather than three. The accumulated savings are considerable. During a typical day there will be two such operations, a display of today's indexes and another of tomorrow's predicted fire danger. The total saved in a 120-day season would be:

2(37¢) (120) = $88.80.

Summary

1. Use the shortest display that contains all the information your office requires.

2. Turn the headings off if more than three displays of the same type follow the first.

3. *Never* use the forest or unit name to define the limits of your display if anything else will work! Don't use a SIG for fewer than five stations—use a LIST scope instead.

4. Consolidate your displays. Find the way to display all the needed stations with the fewest number of commands. The SIG, LIST, and ID range of station numbers provide easy ways to group your stations.

Calculating Fire-Danger Rating
Computer vs Tables
John E. Deeming,
Continued from p. 7

Another important end product is the Adjective Class (AC), a rating designed for public information and regulation purposes. The AC is traditionally expressed as one of five levels: Low (LO), Moderate (MD), High (HI), Very High (VH), and Extreme (EX). It is derived from a combination of Manning Class and Ignition Component shown in the table below.

Manning Class (MC)	Ignition Component				
	0-20	21-45	46-65	66-80	81-100
1	LO	LO	LO	MD	MD
2	LO	MD	MD	MD	HI
Low 3, High 3	MD	MD	HI	HI	VH
4	MD	HI	VH	VH	EX
5	HI	VH	VH	EX	EX

Comparisons of the AC's computed by AFFIRMS and from table outputs produced a distribution essentially the same as that for the Manning Class. The table-derived AC was two steps higher than the computer AC less than 1 percent of the time, one step higher 16 percent, the same 74 percent, and one step lower 9 percent of the time.

These comparisons of the MC's and AC's show that the two methods of computing fire-danger ratings are comparable and that large differences are very infrequent. But, what about those differences? Are there significant operational implications when they do occur?

Weather and fire danger change from day to day and maintaining an appropriate level of readiness often presents administrative and managerial difficulties. It has been our impression for some time that the table-derived fire-danger ratings tend to overreact somewhat to daily fluctuations. This analysis shows that the more sophisticated computer-derived MC and AC are more consistent from day to day. That is, the computer indicated fewer changes in MC from one day to the next.

The average MC change using the table BI values was 1.07; using the computer BI values, it was 0.99. The average AC change using the table values was 0.84; using the computer values, it was 0.67.

Summary

The tables in RM-84 produce fire-danger ratings which often differ slightly from those derived using the computer program AFFIRMS. However, the operational significance of the differences is small, since 75 percent of the time the indicated Manning and Adjective Classes are the same.

The computer is more accurate and consistent, but the manual computing method will produce adequate results.

Cane Gully Fire—DESCON #4. Area burned March 17, 1974; photo taken April 4, 1974. Note the low fire scorch line; herbaceous ground vegetation preferred by wildlife on forest floor released; fuel load reduced to about 1½ tons per acre; most of heavy fuels and much of light fuel is gone; aerial stems of undesirable understory hardwoods killed.

Wildfire Used to Achieve Land Management Objectives

David D. Devet

For decades prescribed fire has been an accepted forest resource management tool in the southern coastal plain. Both prescribed fire and wildfire are important influences on the area's ecology. Fire is a major agent in the perpetuation of subclimax pine forests—one of the objectives of southern pine forest management.

David D. Devet is Fire Management Staff Officer, Francis Marion and Sumter National Forests, USDA Forest Service, Columbia, S.C.

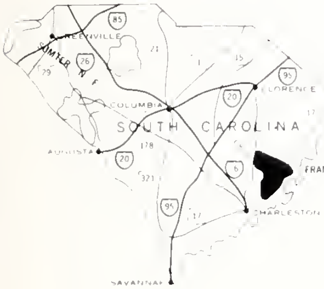
Prescribed fire accomplishes many land management objectives.

- Reduction of hazardous forest fuels
- Control of brownspot disease on longleaf seedlings
- Preparation of site for natural pine regeneration
- Control of undesirable tree species
- Establishment and improvement of game habitat and range forage.

Fire managers have long recognized that wildfires burning under the conditions of prescribed fire could achieve many of the objectives achieved by prescribed fire. They were prevented from allowing wildfires to burn because of the Forest Service policy for fast, energetic, and thorough suppression action to control all fires by or before 10 a.m. the day after the fire. There can be exceptions to the policy only when preplanned and approved by the Chief of the Forest Service.

DESCON

With the idea that some *benign* wildfires could be used to achieve certain land management objectives, forest personnel planned DESCON (Designated Control Burn System) for approval by the Chief. Approval for exception from policy was granted in August 1973, and the plan was put into action during the 1974 spring fire season on the Francis Marion National Forest.



Location of Francis Marion National Forest.

The forest's 249,000 acres are located in the flat coastal plain of South Carolina. Eighty to ninety wildfires occur annually—some of them of a benign nature with the characteristics of prescribed fire.

During the 1974 spring fire season, four DESCON fires occurred. All were in areas of relatively light fuel loads because of a heavy prescribed burning program on the forest. Fuel accumulations were for a period of 3 years or less and the estimated available fuel load was 4 to 5 tons per acre.

Creeks, bays, and roads were major natural and manmade barriers containing the DESCON fires. All four fires were contained with a total of only 18 chains of plowline construction and some short lines made by a slip-on tanker unit. One fire went out naturally along an REA powerline right-of-way when the fine fuels became too wet to burn with a nighttime humidity of nearly 100 percent.

All DESCON fires accomplished prescribed land treatment objectives and none escaped planned holding lines. The best land treatment at lowest cost was obtained on the two larger fires; the major cost was that of maintaining surveillance until the fires were out. Three of the four fires cost less under DESCON than they would have with regular suppression methods.

When benign wildfires occur on areas that have been planned or are suitable for prescribed burning activities, using standard suppression actions simply because the fires were not started with a "planned match" is poor management. Credibility of forest actions was questioned when, on one side of the road, a prescribed burn was in progress while, at the same time, a wildfire was suppressed on the other side simply because it was not planned.

Initially there was some concern about adverse public reaction. Local Forest Service employees and local residents accepted the idea. Forestry groups and agencies were told of the plan and agreed that the principle was sound. Industry foresters have used a modified version of this principle on their lands for years.

The Francis Marion Fire Managers will continue the DESCON program, and plan to improve the prescription by processing the following changes.

- The minimum DESCON fire should have potential for 45 acres or more for maximum cost savings and achievement of land treatment objectives.
- Reduce the amount of surveillance and manage as a scheduled prescribed fire.

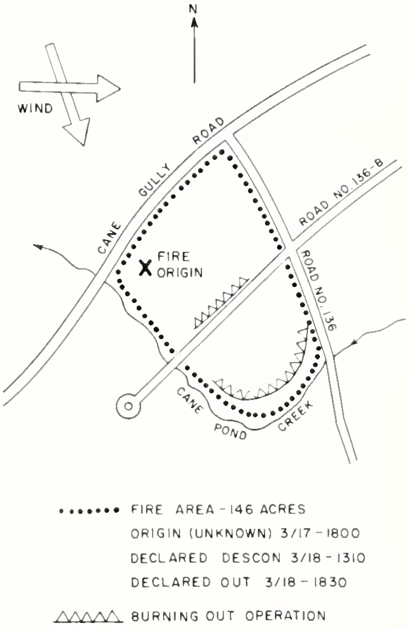
Data for Cane Gully Fire

- Weather at 1300, March 18: W to NW wind, 4 mph
- Ignition component: 49
- Burning index (fuel model D): 10 (light)
- Light head fire consumed grass and pine needles of Loblolly pole and pulpwood stand: about 4 tons per acre
- About one-half chain of fireline constructed
- Roads and creeks served as burnout contrl lines.

Costs

- \$250—Estimated cost of normal suppression action
- \$146—Estimated cost of prescribed burning of area
- \$ 62—Actual cost of DESCON action.

DESCON NO. 4
CANE GULLY FIRE



Communicating

The Role of Fire in the Forest

Hershel C. Reeves

There is a lack of understanding by the public at large and by many land managers of the role that fire plays and should play on our vegetated lands. This misunderstanding is due not only to the lack of consensus on fire policy among professional land managers but also to our credibility gap with the general public.

For decades the only concentrated effort to communicate fire messages to the public has centered on preventing wildfire in the forest or on grassland. Smokey Bear's "Only you can prevent forest fires" and other "Keep Green" type slogans have served well and continue to function for our benefit. Unfortunately, the public has been given only part of the information needed to understand the role of fire in the forest.

The problem is not just one of *how* we communicate with the public and other professionals (Dickerson 1971) but *what* we transmit (Glascock 1972; Plumb 1973). Fire has long been recognized as a potent instrument of change in wild plant communities. People recognize fire effects as good or evil depending upon the viewpoint of the observer (Reeves 1973).

A controlled fire intended to kill back hardwood to induce sprouting for wildlife browse can at the same time consume a hazardous fuel buildup to lessen the potential severity of wildfire. This is viewed favorably by most professional land managers. But the urban dweller who is generally unfamiliar with fire management may see only adverse effects from any fire that kills back the understory.

Ecologists and other experts understand fire climax vegetation such as Pinus sp. and the numerous herbaceous plants that rapidly expand in growth soon after a fire.

The public sees that forest burning contributes to air pollution though no one knows how much.

The causes and seasons of wildfire vary on a regional basis, and the use of fire as a management tool is far more important in some areas, such as the South and Pacific Northwest. So any national fire management policy must be very flexible. A consolidated communication effort to explain fire and its use to the public would appear possible particularly on a regional basis where there is some agreement on the application.

The role of fire in the forest can be discussed under three related but distinct categories:

- Wildfire and its control
- The management use of fire
- Wild land "let-burn zones."

Wildfire and Its Control

Most wildfires are potential problems, but incendiary fires are particularly serious. Sociologists and other social scientists have worked closely with foresters for years to try to determine causes of and possible solutions to incendiary forest fires. Causes for "setting" fires vary with the geographic location and with the economic level, age, and education of the people involved. Forest land managers should make every effort to utilize any community function where they can stress the importance of wildfire prevention.

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Many foresters are reluctant to enter a dialog in a public meeting; this seems to be a serious shortcoming in the profession.

The urgent need for more effective communication on fire matters might therefore be better accomplished by assigning those men with the talent and the desire to communicate to areas where the incidence of man-caused fires is high.

Success in wildfire control has improved over the years. Although fluctuations in climate have influenced fire seasons from year to year, the trend is to fewer fires and smaller average acreage burned in relation to the area under protection. This does not mean a decline in the total number of wildfires but, considering the growth in population, our wildfire control record has improved. The results indicate some success from fire prevention messages (for example, those from Smokey Bear), small group and individual contact, as well as greater efficiency in our fire control organizations.

We must not let our success cause us to discount the continuing seriousness of man-caused wildfires, particularly those of incendiary origin, such as the recent ones in California, Florida, and New Mexico.

The Management Use of Fire

Land managers should be aware of the problem the public faces in discerning the difference between "good" fires and "bad" fires. Fire prevention messages imply that all fire in the forest is bad. Yet, over much of the Nation and particularly in the South, it would be extremely difficult and usually unprofitable to manage forests without the use of prescribed fire. Slash disposal by fire has been characteristic of forest land management in the West for decades.

Prescribed fire is particularly useful as a preventive measure against wildfire (Brackebusch 1973; Reeves 1973), and the public must be convinced of this fact. "It appears that the highest priority for fire research both in potential payoff and probability for success lies in hazard reduction through fuel management" (Chandler and Roberts 1973). The use of fire is the only economically reasonable way to accomplish this objective. Sociologist and others have suggested ways to communicate ideas—various news media as well as public opinion leaders. We must publicize and justify our use of fire in forest management.

Having people versed in communications working in areas where management use of fire is practiced is not enough. More foresters must take advantage of opportunities to speak before civic groups and other organizations to explain the use of fire as a management tool and how it differs from wildfire. Mobley and Kerr (1973) presented some useful information which southern forest land managers should know before they can communicate intelligently with the public on fire matters. It is important that we know *what* to say as well as *how* to say it. The fact that

Prescribed fire reduces fuel loading without damaging residual trees. (Texas Forest Service photo.)

prescribed fire can be used to maintain a stage in ecological succession needs more emphasis than it has received in the past. This role of fire has been used by ecologists to justify the creation of zoned areas where certain wildfires will not be suppressed.

Wild Land Let-Burn Zones

A far-reaching policy change in some wild lands of the United States is the designation of zones in which lightning-caused fires are permitted to burn under prescribed conditions. The ecological and economic justification for this policy may be sound, yet there is always the possibility that a disastrous wildfire will make a run out of such a zone and result in unanticipated destruction. If we are convinced of the value of ecological changes due to lightning-caused wildfires in such areas, then it may be reasonable to allow man to initiate these fires under more favorable burning conditions.

The Forester as Fire Expert

Our fire educational campaign needs a new direction. We must differentiate between the roles of fire in the environment. We also must identify and promote or symbolize the forester as a fire expert. While all foresters are not experienced in fire control and prescribed fire use, they are most likely to have the

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background training. Through a well-thought-out communication effort, the forester could be depicted as the professional putting out a forest fire as well as the scientist using fire for man's benefit. His prowess on a raging wildfire could be contrasted to his prudence in conducting a prescribed fire.

This image would fit within the overall management role of the forester, especially when he is using fire to prevent wildfire in the forest.

A good opportunity to promote a favorable image of the forester may be through the proposed Jack Webb TV series on the USDA Forest Service. If the series is run, let us hope there are segments dealing with various aspects of fire rather than just the high drama of a raging forest fire destroying everything in its path. Hopefully, he will use some of the southern national forest activities where prescribed burning is a regular but less spectacular type of fire than that of slash disposal in the West.

An expansion of TV spots by the Society of American Foresters and such companies as Weyerhaeuser to incorporate the beneficial as well as the adverse effects of fire would be desirable. Any educational effort in the mass media (particularly TV), along with local endeavors, to explain fire as a land management tool will make the management of forests less difficult.

A wildfire destroys. (Texas Forest Service photo.)

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Infrared Technology Improves Mopup Efficiency

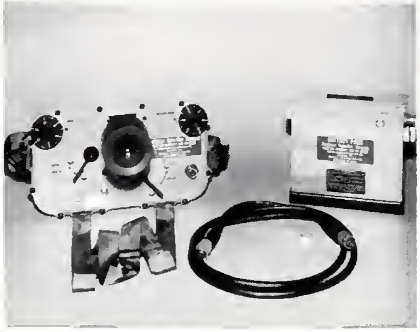
Warren A. Ely

The term "infrared" refers to light rays that have longer wavelengths than light rays within the visible spectrum; infrared rays cannot be seen by the naked eye. The Division of Forest Fire Protection of the Pennsylvania Bureau of Forestry has been exploring infrared technology and its potential applications to forest fire detection and control for several years.

Last spring the Division borrowed a handheld infrared heat sensor from the Army Night Vision Laboratory at Fort Belvoir, Va. This instrument was developed by the Army for enemy personnel detection in Vietnam. Body heat emits infrared rays that are readily detected by the thermal viewer. The Division felt this instrument would be useful in forest fire control. The thermal viewer was tested successfully throughout the spring fire season. One of the major values of the equipment was found to be the location of "hot spots" on fires that, due to drought conditions, had burned underground. Once located, these hot spots could be "mopped up" by fire crews, keeping the fire under control.

Used in Minnesota

The USDA Forest Service knew of Pennsylvania's work with the thermal viewer and on Thursday, August 1, called for the viewer and an operator to go to the Boundary Waters Canoe area in northern Minnesota to help extinguish several fires burning on the Superior National Forest. These fires were burning along the surface because of extremely dry conditions.



A handheld infrared scanner and battery pack of the type used in locating "hot spots" on fires on the Superior National Forest. (U.S. Army photo.)

By Monday morning, August 5, the viewer and operator were on the 1,000-acre Prayer Lake fire with Forest Service mopup crews. Before the week was out, the viewer had been used also on the Magnetic Trail fire and the Plume Lake fire. The viewer was responsible for detecting many hot spots that otherwise might have gone undetected. A few examples:

- Hot spots were detected through dense spruce and fir foliage at a distance of 70 to 80 feet.
- Several hot spots, burning in thick moss without producing any smoke, were immediately detected by the viewer. In at least one case, a firefighter had just walked over the area without discovering the hot spot.
- The viewer detected a heat source in an area that had been worked over the preceding day. There was no smoke and the ground surface did not feel unusually warm. However, a hand inserted several inches into the duff blistered.
- One hot spot had burned into the rotten center of a live tree and had not been discovered by a mopup crew that had just left the area. Again, it was immediately detected by the viewer.
- In one case a hot spot was found directly beneath the feet of a firefighter. He had been standing on it several minutes without realizing it.

Advantages

The three main advantages of using the viewer on these fires were:

- It virtually eliminated "cold-trailing" in the traditional sense of the term. This, of course, saved a great deal of time and labor. If an area can be seen, it can be ascertained whether it is hot or cold.
- It was extremely useful in determining how well a hot spot had been mopped up. In many cases, the viewer detected heat sources in areas that had already been worked over: The crews on the line frequently asked for the viewer to check on their work.
- It was effective in locating hot spots when other indicators (smoke and flames) were missing.
- Infrared technology has a promising future in fire control. With only a few modifications, the handheld thermal viewer will be an extremely valuable tool in fire suppression work.

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Fire Status Display

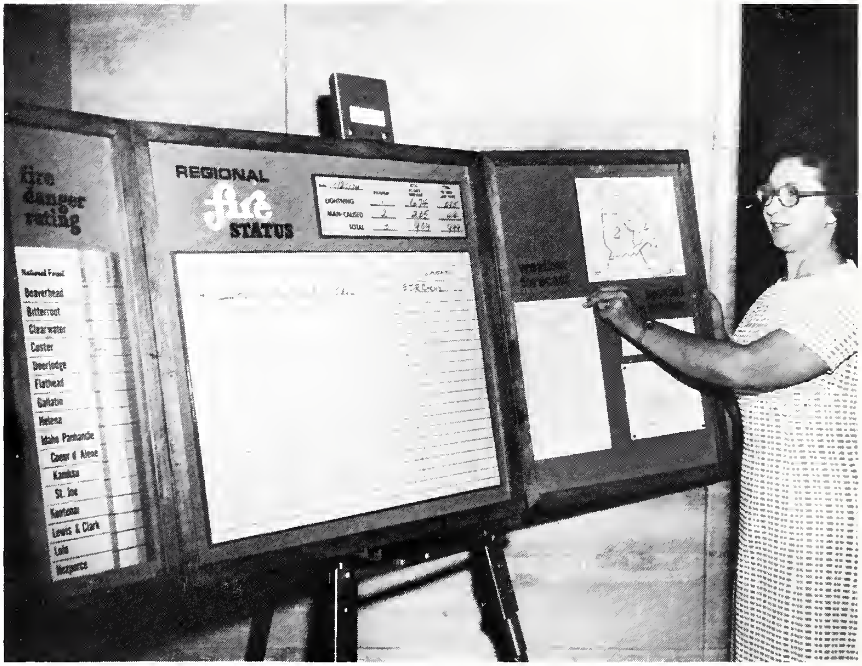
Floyd R. Cowles

Throughout the fire season, visitors and employees express an interest in the current fire situation. To answer this need, the Northern Region's Divisions of Fire Management and Information and Education designed a fire status board to visually display vital information.

The fire status board provides the following information:

- Daily fire weather forecast
- Fire danger ratings, by Forests
- Project fire information
- Other agency, regional, or national fire situations
- Current lightning and man-caused fire statistics and a comparison with previous year
- Closure and/or restrictions in effect
- Other special information, as appropriate.
- The portable 28-inch-high status board of cork backing has two hinged wing panels for ease of storage. These hinges allow the board to be used as a table display as well as easel mounted. Wing panels are 10 inches and 21½ inches in width, and the main section is 31½ inches wide.

A plan is available from Fire Management, USDA Forest Service, Missoula, Mont.



Mrs. Evelyn Harper demonstrates posting fire data to the Northern Region's Fire Status Board.

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